Conclusions and recommendations

flexRISK Final Workshop

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Dieses Projekt wird aus den Mitteln des Klima- und Energiefonds gefördert und im Rahmen des Programms „NEUE ENERGIEN 2020“ durchgeführt.

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Structure

- Geographical distribution of risk
- Effects of phasing-out scenarios
- Limitations and problems of our approach
- Possibilities for further work with existing results
- Recommendations for stakeholders
- flexRISK – where are we?

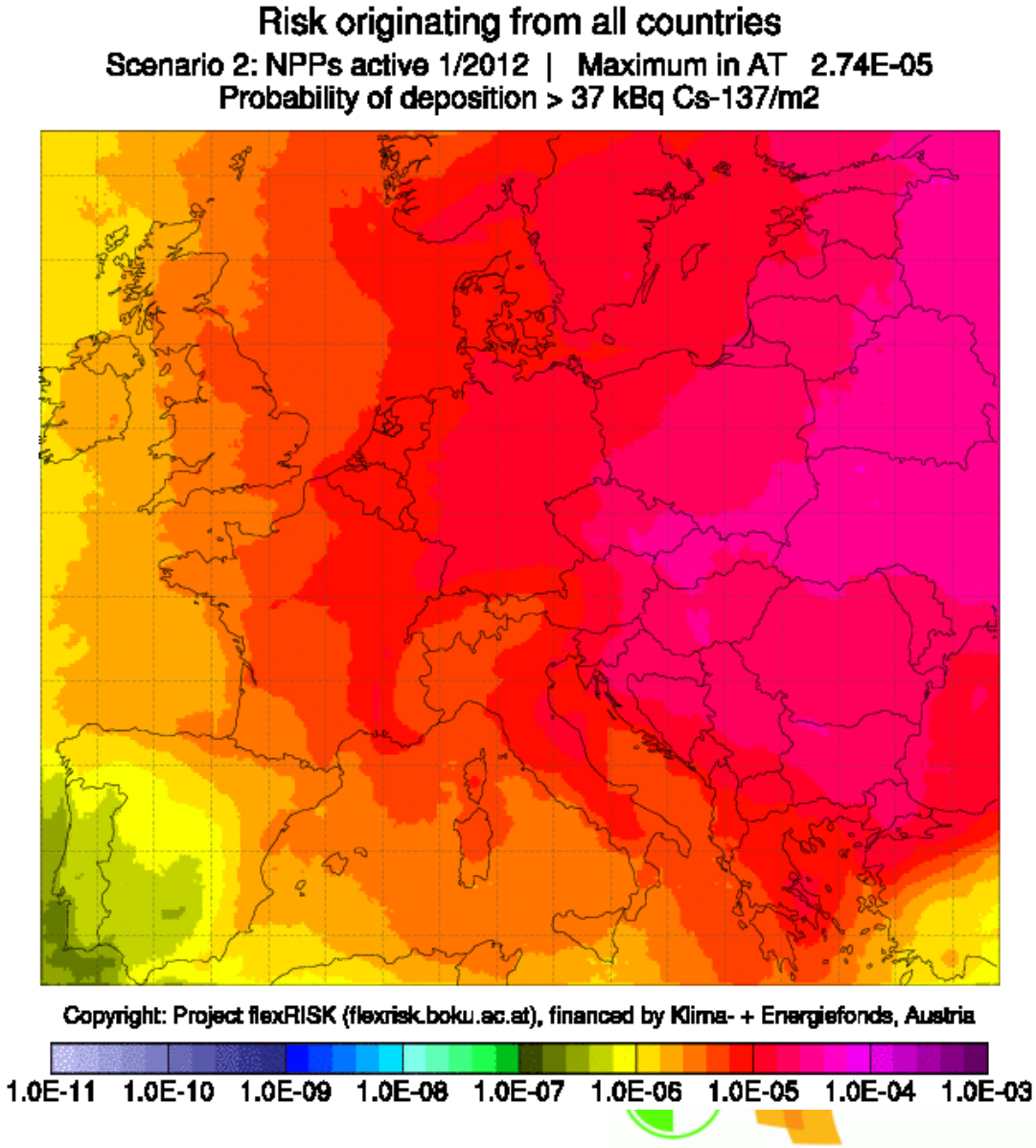
flexRISK

Geographical distribution of risk

Low contamination:

Determined by dominant wind directions and distribution of plants

Strong W-E gradient:
1e-7 Portugal
1e-6 Western Coast
1e-5 Western Central Europe
1e-4 Eastern Central Europe



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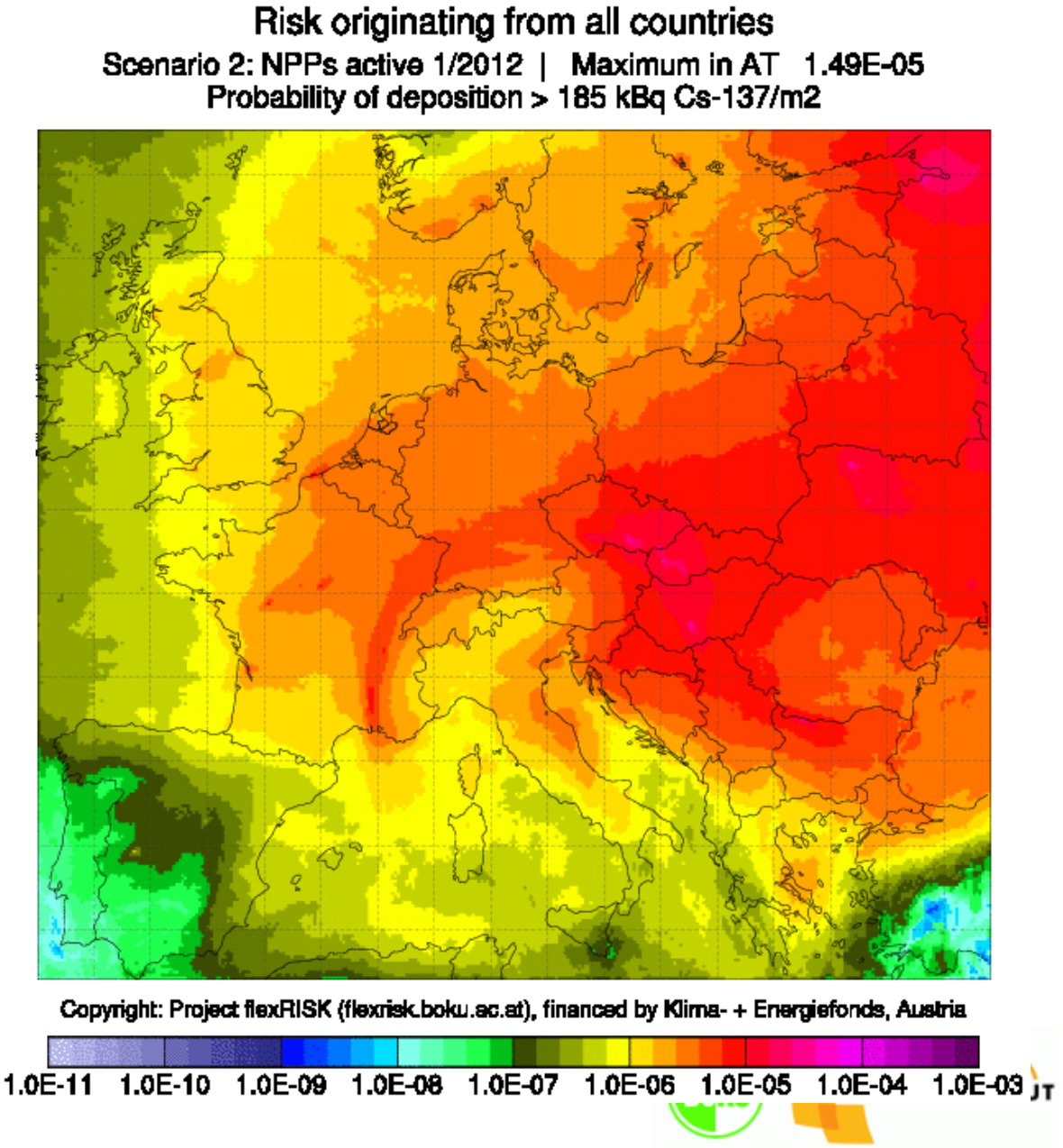
Geographical distribution of risk

Moderate contamination

Stronger influence of siting of NPPs

Distinct maxima:
Rhone valley
Temelin-Dukovany-Bohunice-Mochovce-Paks-Krsko region
Ukraine and Russia

Austria and Poland have heavy burden



Geographical distribution of risk

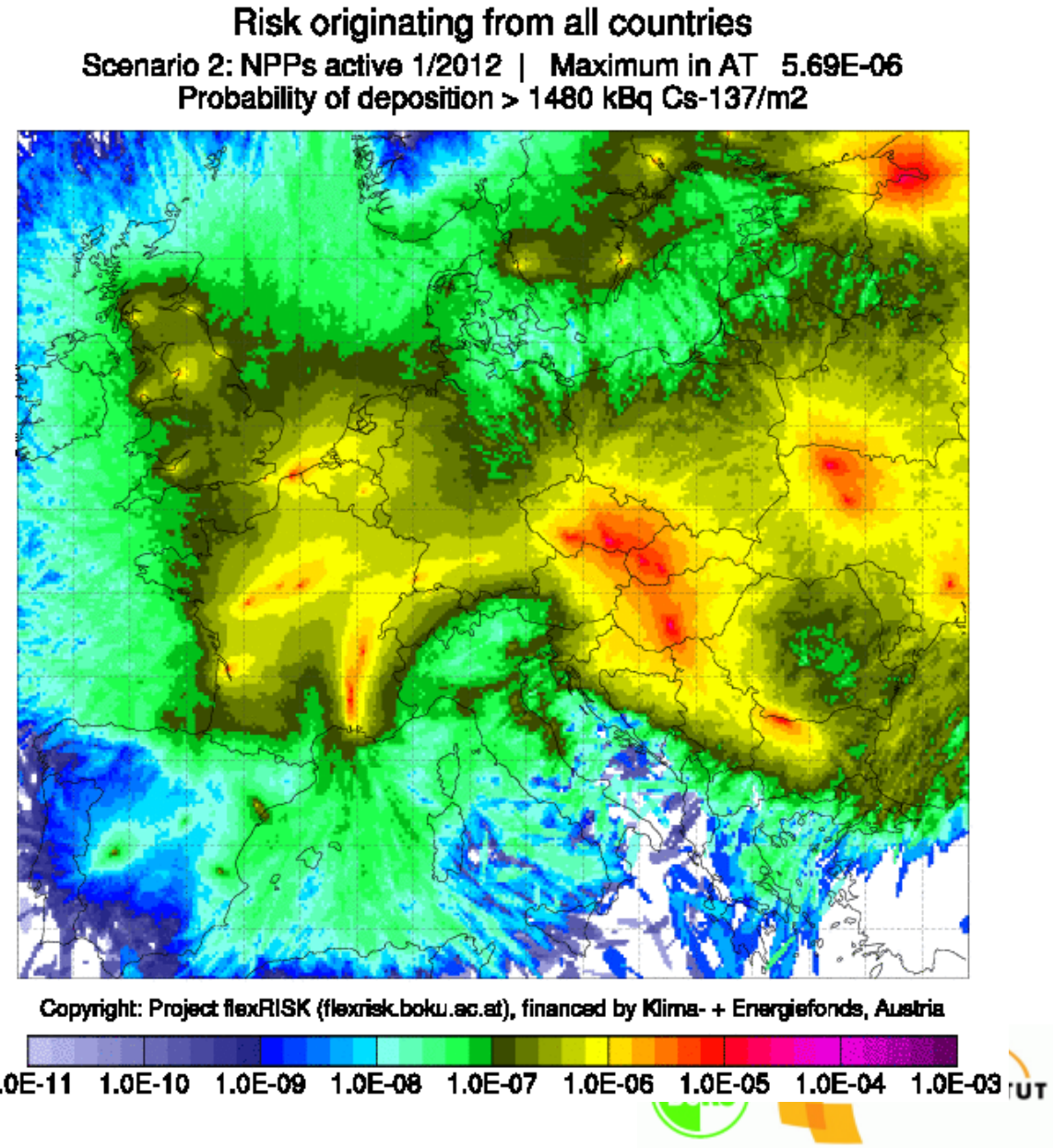
Heavy contamination

Dominated by sites and their accident severity & frequency

Heaviest maximum:

Temelin-Dukovany-Bohunice-Mochovce-Paks-Krsko region Ukraine and Russia

Also near RBMK sites

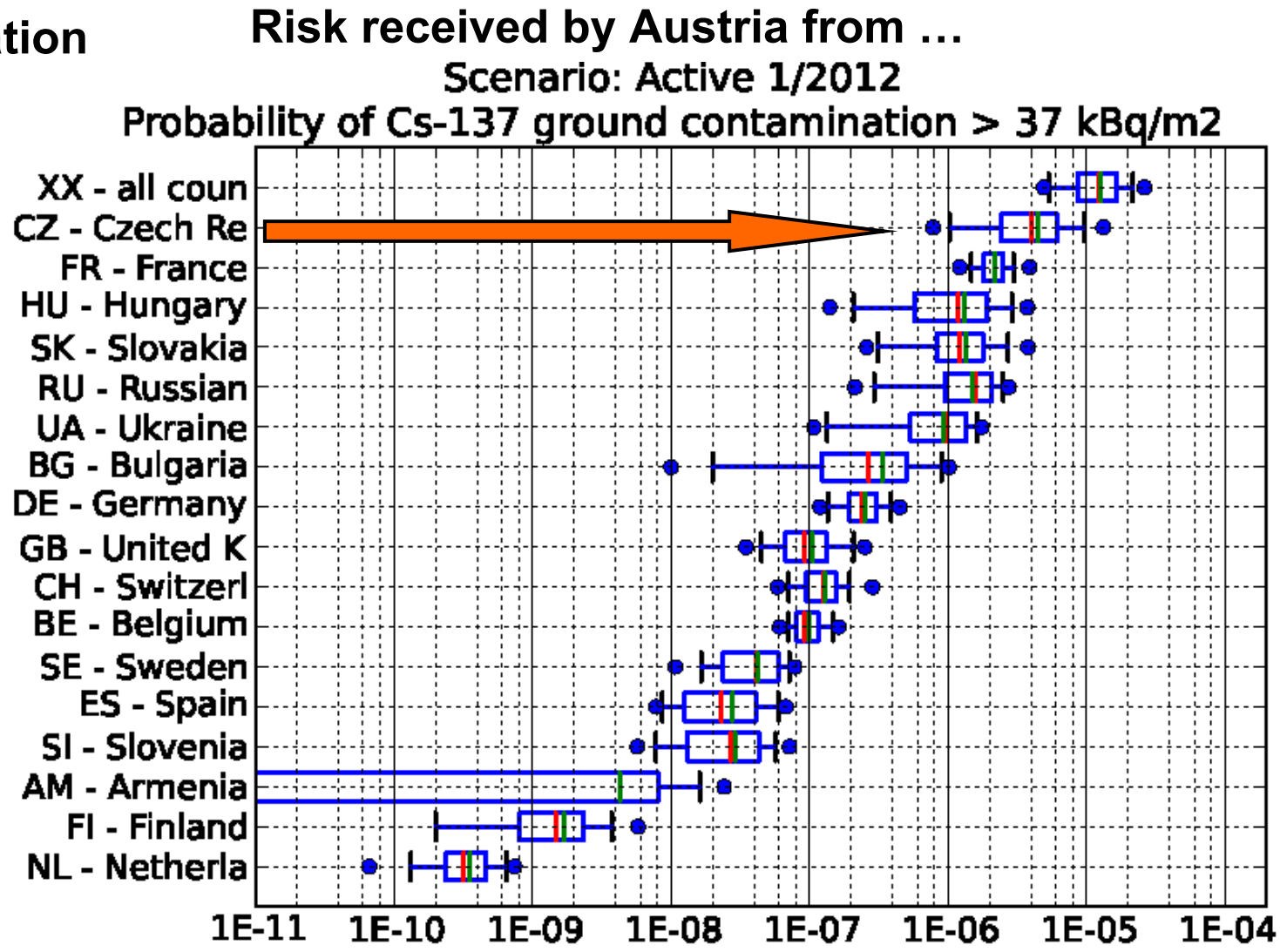


flexRISK Risk originator for Austria – low contamination

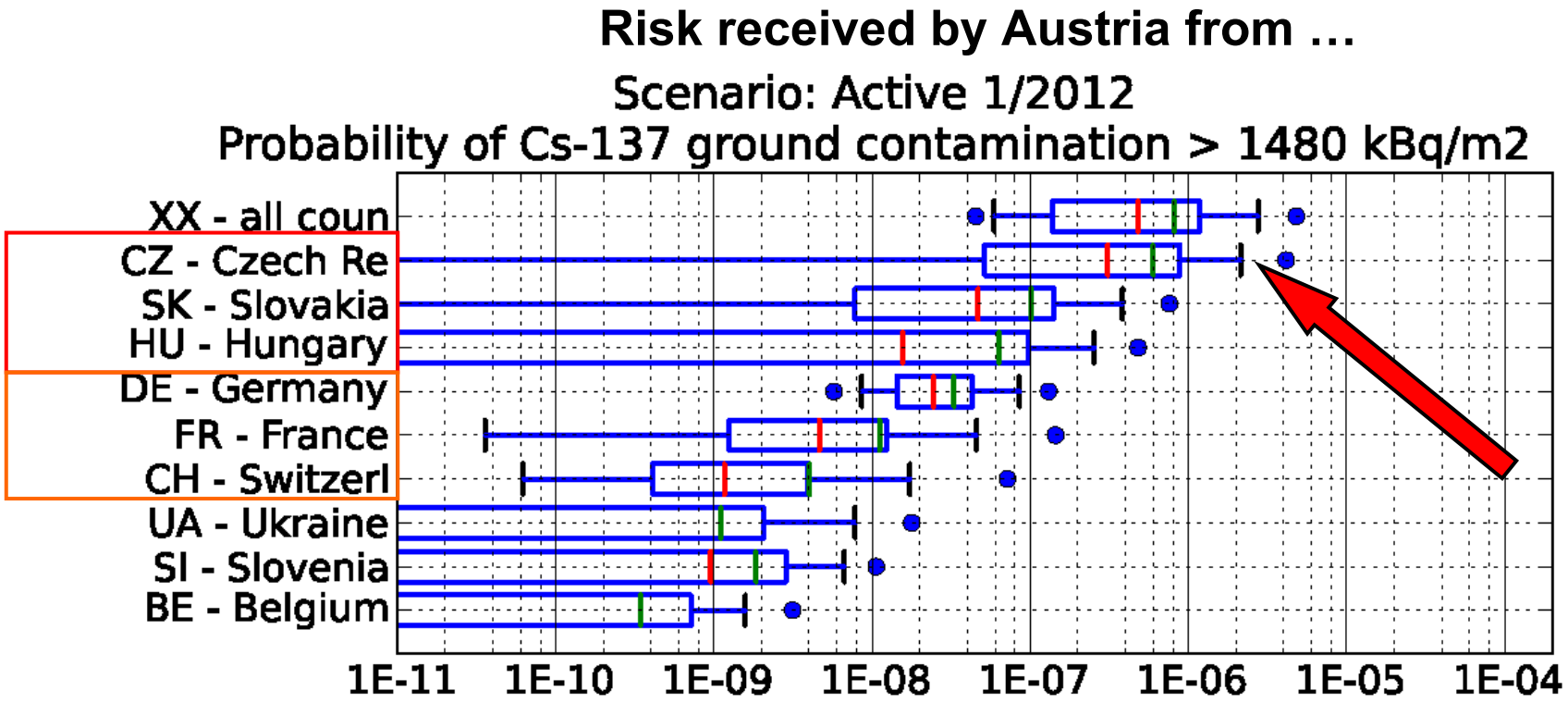
Low contamination

Could come from almost anywhere

(Armenia to Finland, Sweden, UK)



flexRISK Risk originator for Austria – high contamination



Contribution of each NPP country to Austria's risk of receiving a contamination over 1480 kBq/m2 on the part of the country indicated in the box-and-whisker

Risk is dominated by CZ,
but for big areas Germany advances from rank 4 to rank 2
Chernobyl (UA) could have hit us with 1500 instead of 100 kBq/m2 !!

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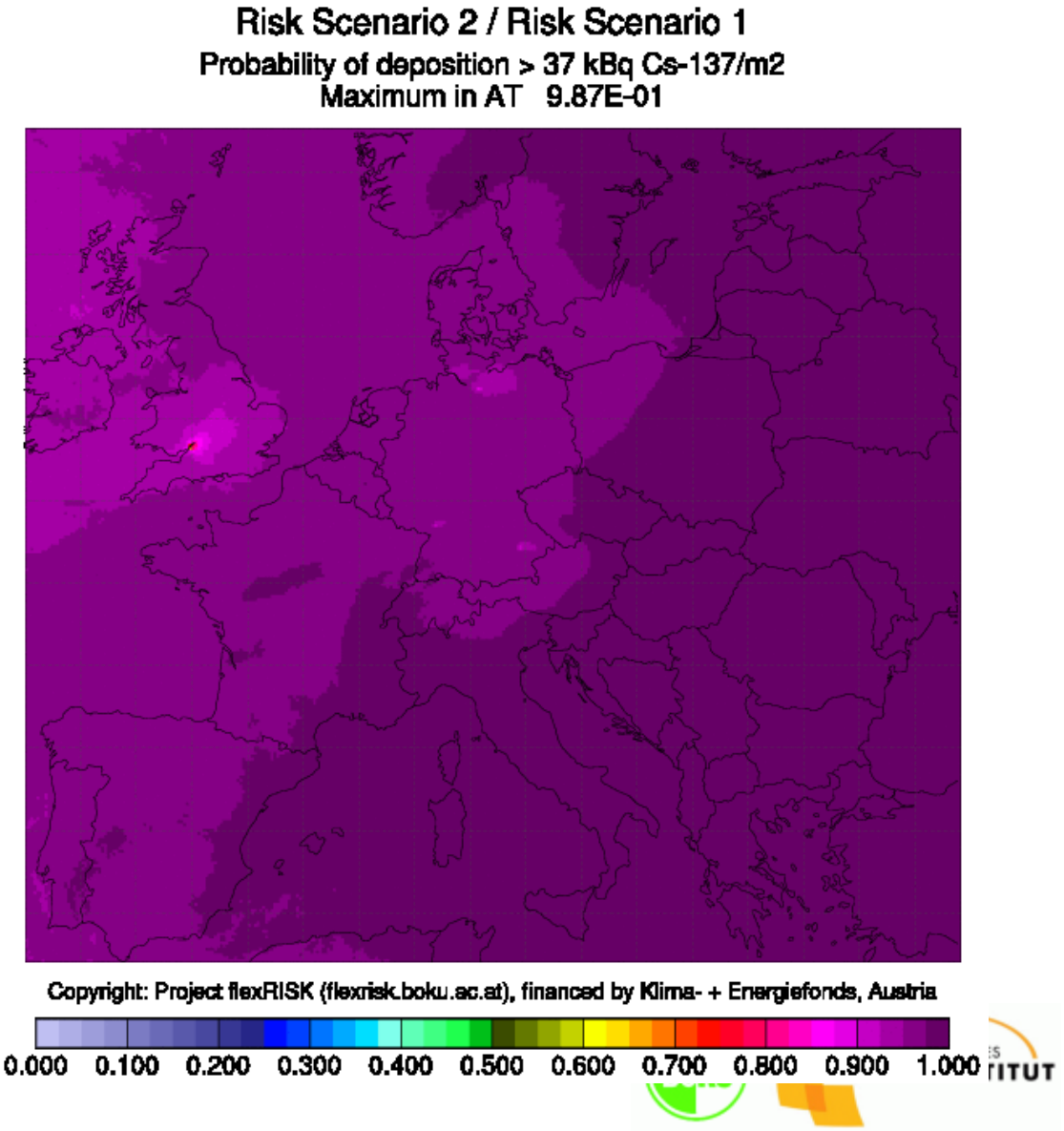
Effects of phasing-out scenarios

S 2 / S 1:
2011 shutdowns in Germany and UK

Minor effects on low contamination

Effects over large areas

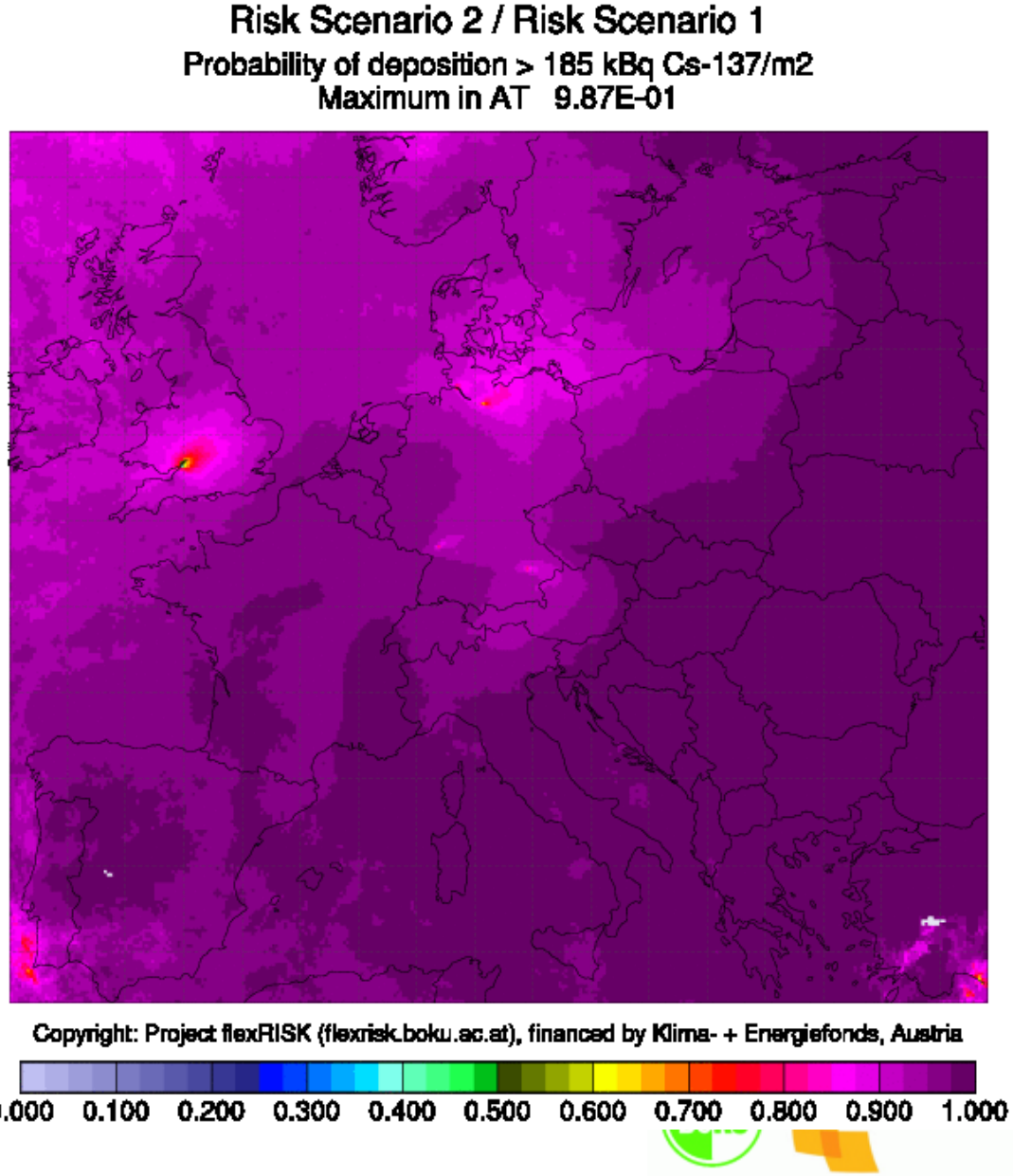


Effects of phasing-out scenarios

S 2 / S 1:
2011 shutdowns in Germany and UK

Moderate contamination:

Risk reduction by 20 to 30 % near the sites,
10 % in Western Austria



Effects of phasing-out scenarios

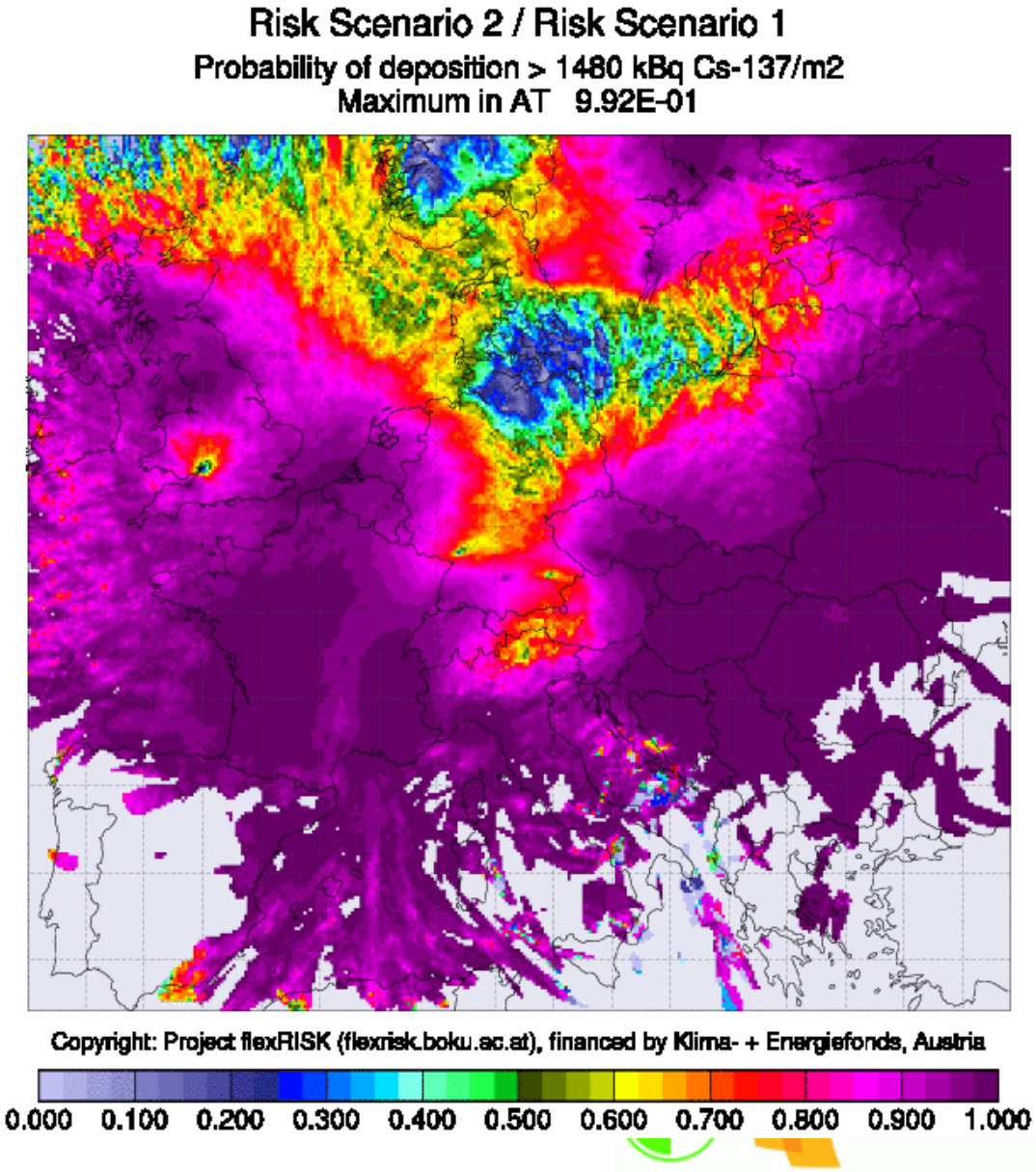
S 2 / S 1:
2011 shutdowns in Germany and UK

Heavy contamination:

Most of risk eliminated in Northern Germany

10 to 30 % reduction in Southern Germany and Western Austria

No change in large areas to S and E



Effects of phasing-out scenarios

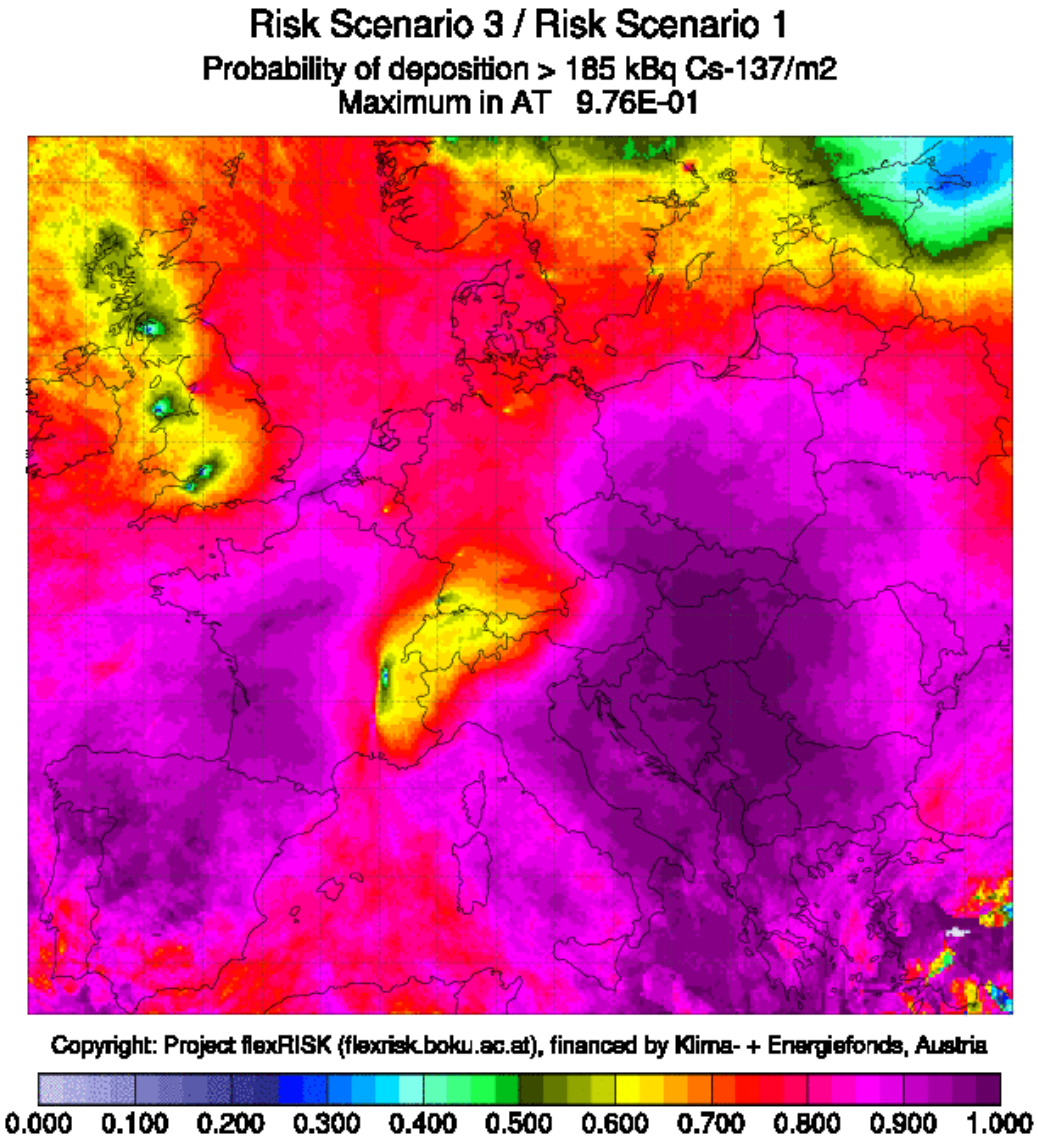
S 3 / S 1:
2011 shutdowns in Germany and UK plus all pre-1980 units

Moderate contamination:

40 % reduction in Switzerland, SW Germany, Vlbg, Tirol

and UK, Scandinavia !

Not much change for Eastern Austria (not plants in the East phased out)



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Effects of phasing-out scenarios

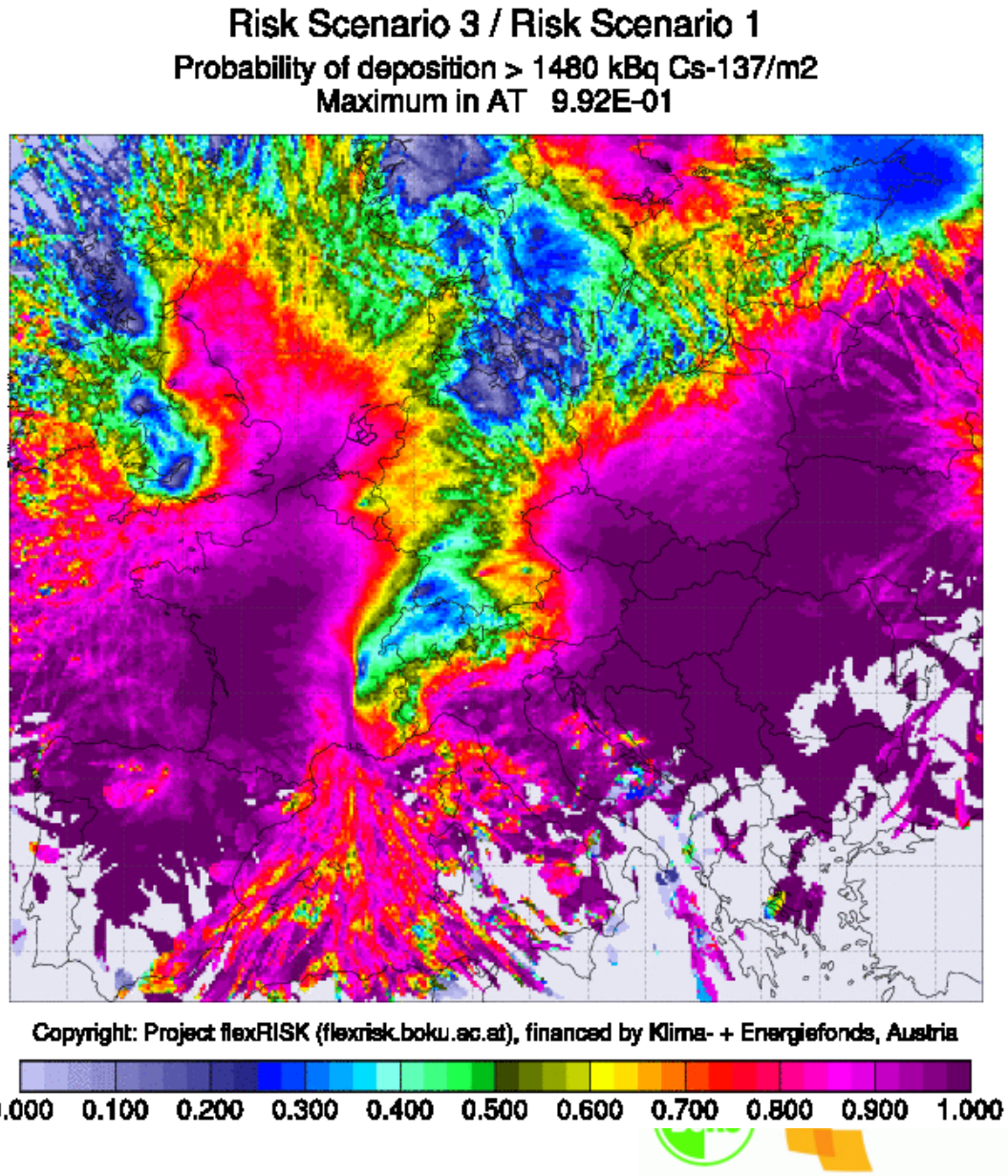
S 3 / S 1:
2011 shutdowns in Germany and UK plus all pre-1980 units

High contamination:

Large reductions in Switzerland, all of Germany, W Austria

and UK, Scandinavia !

Not much change for Eastern Austria (not plants in the East phased out)



Limitations and problems of our approach

- How well can one single accident represent the whole spectrum of accidents?
- How reliable are the accident frequencies? They have a very strong influence on the result – except for most extreme levels, amount of release is only secondary
  - Do they really span more than a factor of 1000?
  - Are they larger if all external initiators etc are considered?
- How to measure the impact on one country?
- Thus, don't just pick results from work like this to single out plants. Each plant needs to be carefully addressed.
- Technically: though thanks to VSC, we could do all the computations, but we are near limits:
  - Storage amount
  - Transfer times (for some sets of results, days !)
  - Maybe too much information …

flexRISK Possibilities for further work with existing results

- Work that we still want to do now
  - Add missing dose evaluations
  - Add export-import budget and percent of some risk
  - Put some more results (e.g. scenario impact) on the web site
- Multiply doses / risks with population data, economy
  - Number of affected people by site and unit on average
  - Number of people / agricultural area over intervention level in single case
  - Collective doses and health consequences
  - Detailed evaluation for emergency preparedness:
    - Statistics as function of distance
    - Arrival time
    - “7 day” concept not adequate – which 7 days?
- Statistical evaluations, improving results with extreme value statistics, smoothing of high contamination / dose patterns

Recommendations for stakeholders

1. **How much threatened is Austria (or other countries) … ?**

- Almost any NPP in Europe might cause a contamination similar to “moderate Chernobyl”-type of consequences
- A large number of NPPs may cause a situation where stable iodine would be given to children. Excluded are only Scandinavia, Romania, Spain.
- All of Europe (except Norwegian coast) could receive contamination that requires long-term relocation of people
- So we do need all the emergency preparedness!
- Many countries would need more preparedness, e. g. iodine tables to be stocked country-wide and at home and in schools

2. What should be done to reduce our risk ?

- Even though long-range high contamination is possible, this risk is concentrated near plants
- Thus, Austria could benefit very seriously from closing nearby plants in CZ, SK, HU in a similar way as Northern Germany had benefit from closing Kruemmel and other NPPs in the area
- Continue thorough evaluation of nearby plants to identify biggest risk originators

Recommendations for stakeholders

3. Which arguments could the study deliver ?

- Austria, especially its eastern part, is unusually exposed to risks of NPPs in other countries.
- Another, very detailed proof that nuclear risk is not only transboundary but truly European-scale
- Winners and loosers (net exporters and importers can be identified)
- Potential consequences inside nuclear countries can be shown
- Europe-wide list of priorities for risk reduction could be given, at least after sensitivity study for impact of accident frequency

flexRISK – What is waiting …

- Finalisation of results and on-line publications
- Production of “advertising” material (CDROM, flyer, postcards or whatever)
- Scientific final report, to be published as “BOKU-Met Report”
- Final report & budget to FFG
- Scientific publications & presentations
- … hopefully many successful follow-up and spin-off studies

flexRISK Finally, what have we accomplished

- A kind of mammoth task has been completed (especially concerning research of all the 200+ NPPs and the calculations & programming)
- A large amount of material is on-line so everybody who wants can see possible consequences of severe NPP accidents at any site in Europe
- A rich data set that allows many more evaluations
- A flexible set of tools (though many of them are not in the shape we would like them to see … in the end, a lot of work had to be done in a rush)
- Some impact (April 2011 press event with world-wide newspaper coverage, interview yesterday with German radio Deutschlandfunk)

Thank you

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Advisory Group

Klie.en
FFG

VSC
(supercomputer)

ECMWF (data)

ZAMG
(ECMWF access, software)